



Canada in a Changing Climate: Health Impacts Research and Implications for Successful Adaptation

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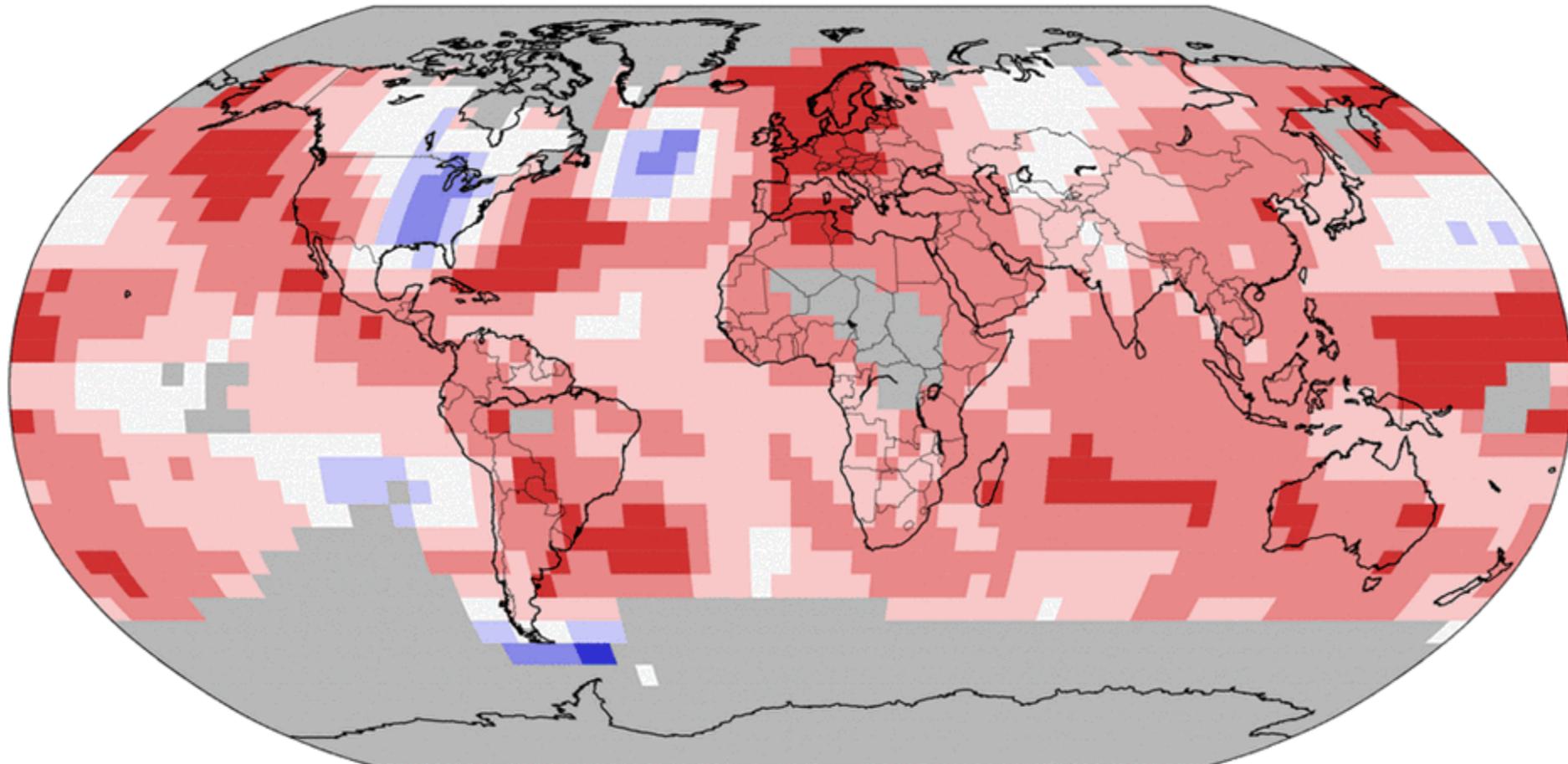
Public Health Ontario
Occupational & Environmental
Health Seminar
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Land & Ocean Temperature Percentiles Jan–Nov 2014

NOAA's National Climatic Data Center

Data Source: GHCN–M version 3.2.2 & ERSST version 3b




**Record
Coldest**


**Much
Cooler than
Average**


**Cooler than
Average**


**Near
Average**


**Warmer than
Average**


**Much
Warmer than
Average**


**Record
Warmest**



Health Impacts of Climate Change

Climate Change
 Health Impacts



Extreme Events

Gradual Change



Natural Environment

Built Environment

Social Environment



on the social determinants of health

Determinants of Health

Physical Environment

Personal Health Practices

Employment/ Working Conditions

Health and Social Services

Social Networks

Culture



Health Impacts

Temperature- related Illnesses

Vector-borne diseases

Effects of water and food contamination

Air-pollution health effects

Extreme weather events

Social and economic changes



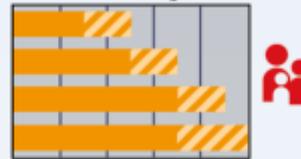
Regional key risks (IPCC Synthesis Report 2014)

Polar Regions (Arctic and Antarctic)

Risks for ecosystems



Risks for health and well-being



Unprecedented challenges, especially from rate of change

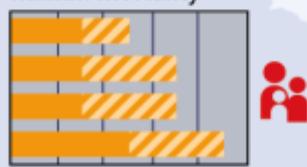


North America

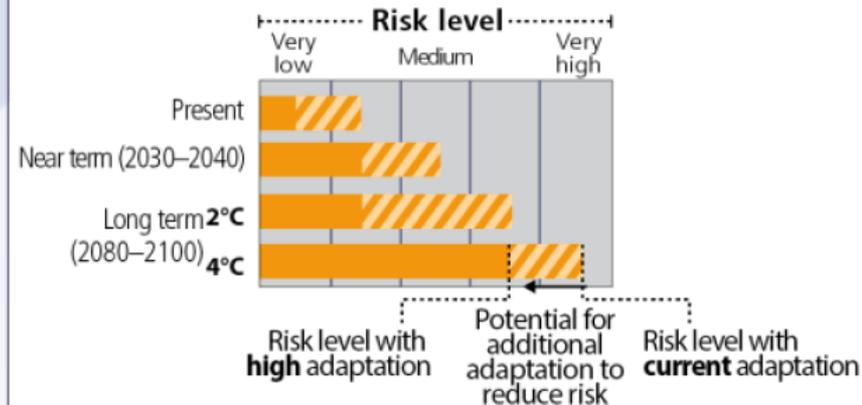
Increased damages from wildfires



Heat-related human mortality



Increased damages from river and coastal urban floods

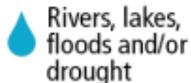


Representative key risks for each region for



Glaciers, snow, ice and/or permafrost

Physical Systems



Rivers, lakes, floods and/or drought



Coastal erosion and/or sea level effects



Terrestrial ecosystems

Biological Systems



Wildfire



Marine ecosystems

Human & Managed Systems



Food production



Livelihoods, health and/or economics

Major Categories of Health Impacts

- Injuries, disease and deaths due to more intense heat waves and fires } Very High Confidence
- Under-nutrition resulting from diminished food production } High Confidence
- Food and water-borne diseases } Very High Confidence
- Vector-borne diseases } Medium Confidence
- Modest improvements in cold-related mortality and morbidity in some areas } Low Confidence



A Call to Action for Health

“Climate change...the defining issue for public health during this century”

Dr. Margaret Chan, Director General, WHO, 2007

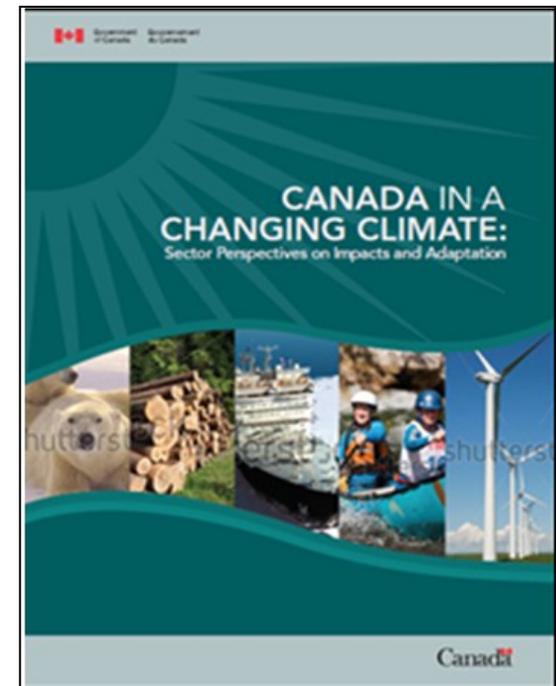
But Also – American Public Health Association (2010),
Lancet Commission (2010), and US
Environmental Protection Agency (2013)



Assessment Update 2014

Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation

- Update to the 2008 report *From Impacts to Adaptation: Canada in a Changing Climate*
- Assesses literature published since 2007 on climate change impacts, adaptation and vulnerability in Canada
- Includes chapters on natural resources, food production, industry, biodiversity and protected areas, **human health**, and water and transportation infrastructure.
- Targets decision-makers from government, business and industry, science and policy advisors and university level instructors and students



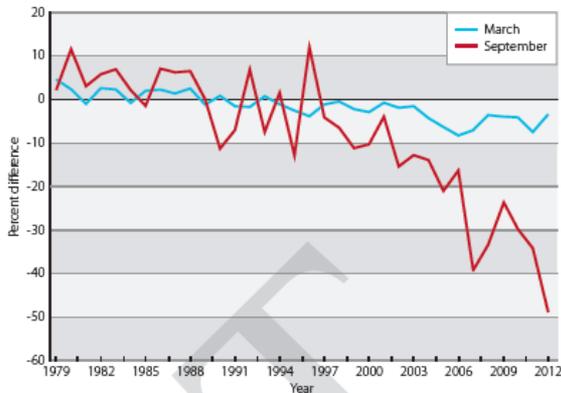
Assessment Update 2014: Key Findings



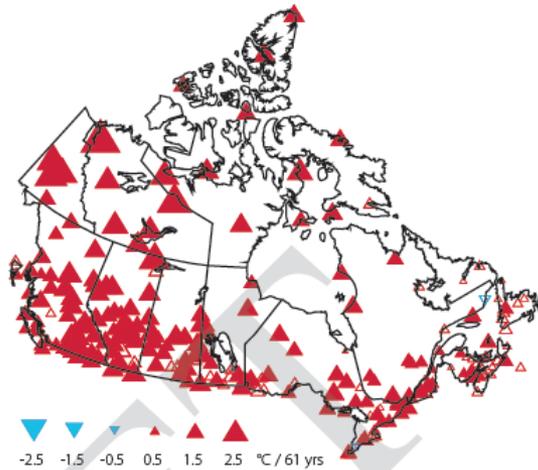
Canada's Changing Climate

Canada's changing climate affects pathways through which impacts on the health of Canadians and the health sector occur

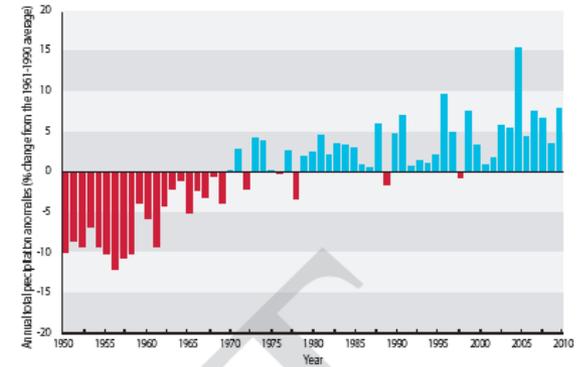
Decreasing sea ice extent



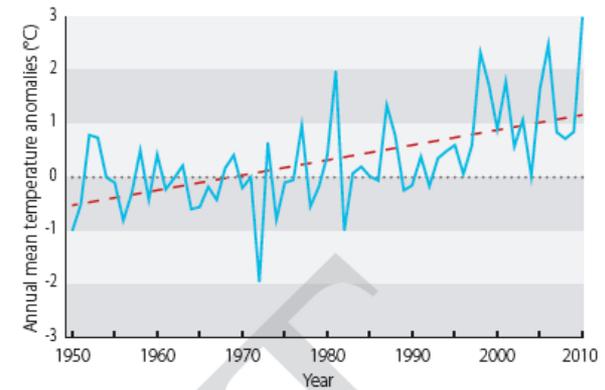
Amount of warming varies across Canada



Increasing Precipitation



Warming trend of 1.5° C



Key Findings

There is stronger evidence of the wide range of health risks to Canadians posed by a changing climate

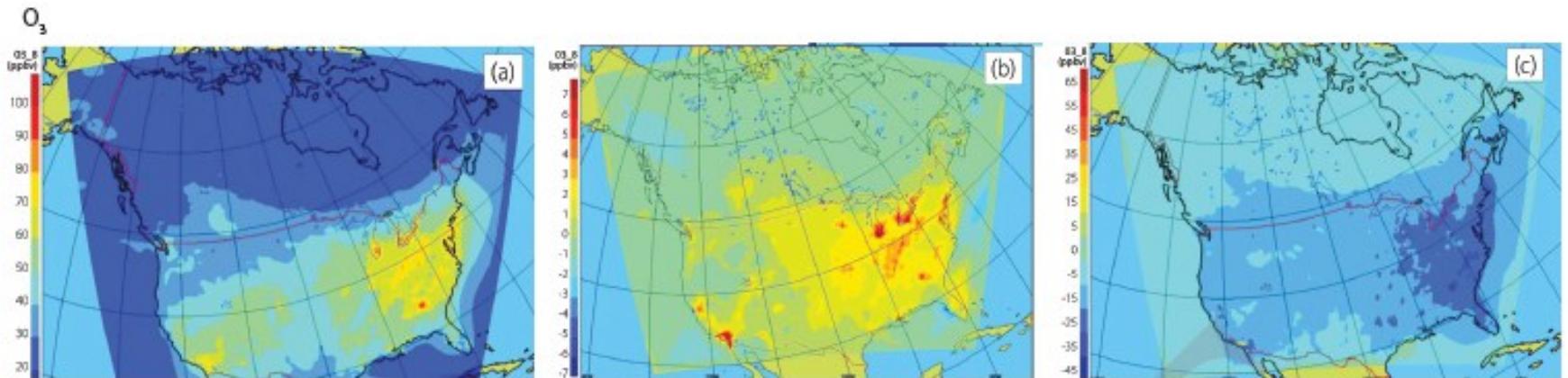


Health Risks from Impacts on Air Quality

Ambient Air

Climate change will increase health risks from poor air quality (e.g., O₃, PM, allergens)

Between 1995 and 2009, the length of the ragweed season increased by 27 days in Saskatoon and 25 days in Winnipeg



Health Risks from Impacts on Air Quality

Air Contaminants	Climate Change and Related Drivers	Health Risks
Ground-level ozone	Increased temperatures	<ul style="list-style-type: none"> • Premature mortality • Respiratory symptoms, inflammation • Impacts on immunological defences • Cardiac effects • Adverse long-term respiratory impacts
Particulate matter - coarse (PM _{10-2.5}), fine (PM _{2.5}) and ultrafine (PM _{0.1})	Wildfires Drought Renovations to weatherize buildings	<ul style="list-style-type: none"> • Mortality • Cardiac outcomes • Lung cancer mortality • Restricted activity days • Respiratory symptoms • Bronchitis • Asthma exacerbation
Aeroallergens (eg., from trees, grasses, weeds, molds, dustmites)	Warmer temperatures	<ul style="list-style-type: none"> • Allergic responses in sensitized individuals • Exacerbation of respiratory diseases (e.g., asthma and chronic obstructive pulmonary disease)
Fungi (e.g., and infectious bacteria)	Moisture in buildings from infiltration of rain or flooding Poorly designed ventilation and air-conditioning systems Poor building maintenance Warmer and drier summers in western Canada	<ul style="list-style-type: none"> • Respiratory disease • Cryptococcal disease (cryptococcosis) which can result in pneumonia or meningitis
Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs)	Dampness in buildings	<ul style="list-style-type: none"> • Asthma • Allergies
Carbon monoxide (CO)	Use of portable gas-powered or electric generators, oil and gas furnaces, fireplaces, or candles during weather-related emergencies	<ul style="list-style-type: none"> • Fire-related injuries and death • CO poisoning



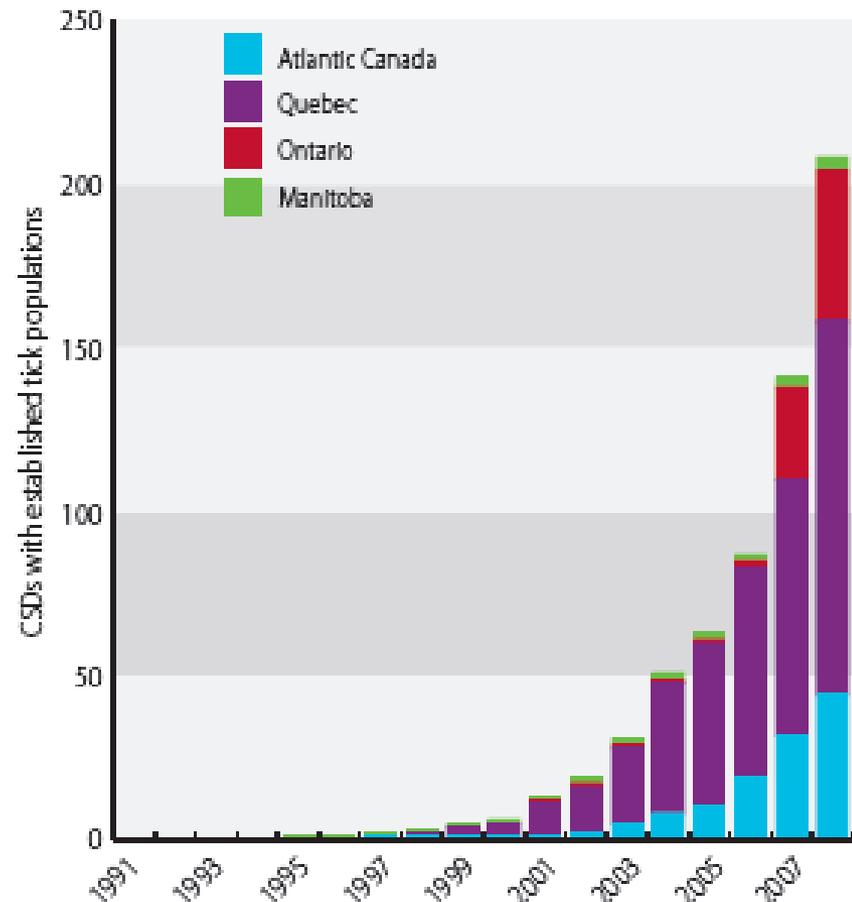
Food and Water Quality at Risk

- Greater confidence of link between cases of **salmonellosis** and higher temperatures and between acute **gastrointestinal illness** and both high and very low precipitation levels
- Limited information on climate change impacts on **food security** and health in southern Canada but significant concern in northern Canada
- Climate change could affect pathways by which **chemical contamination** occurs in water bodies (e.g, pesticides, nutrients, POPs) through flooding, storms and precipitation

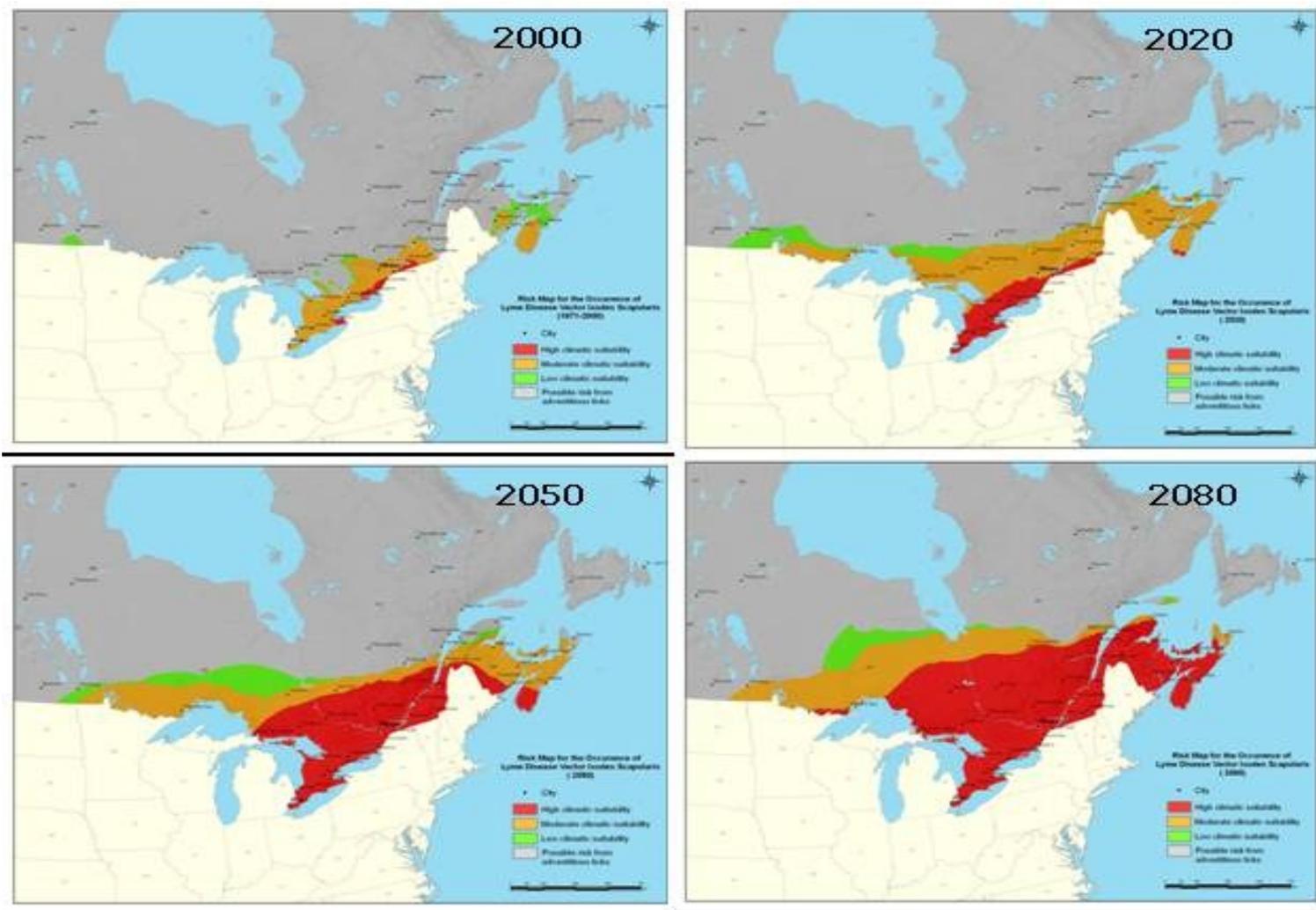


Vector-borne Disease Emergence in Canada

- Emergence of Lyme risk in the Canadian environment is underway - the annual incidence of Lyme disease has increased from approximately 30 cases a year to over 250 in recent years
- Lyme vector is spreading into Canada at a rate of 35-55km per year



Risks from Lyme Disease will Continue to Grow



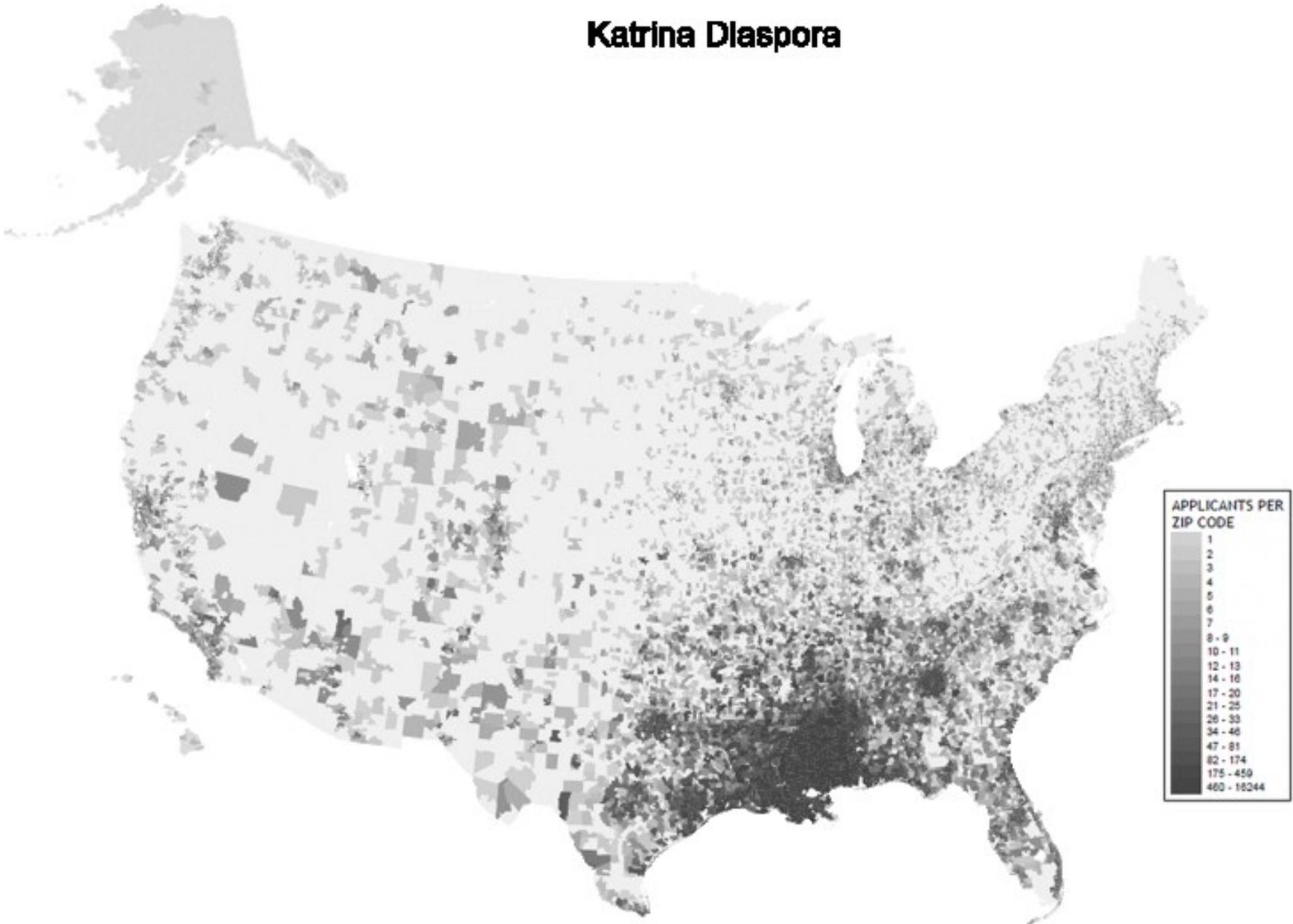
Key Findings

A range of climate-related natural hazards continue to impact communities, presenting increasing risks to health in the future



Hurricane Katrina - 800,000 Americans Displaced

Katrina Diaspora

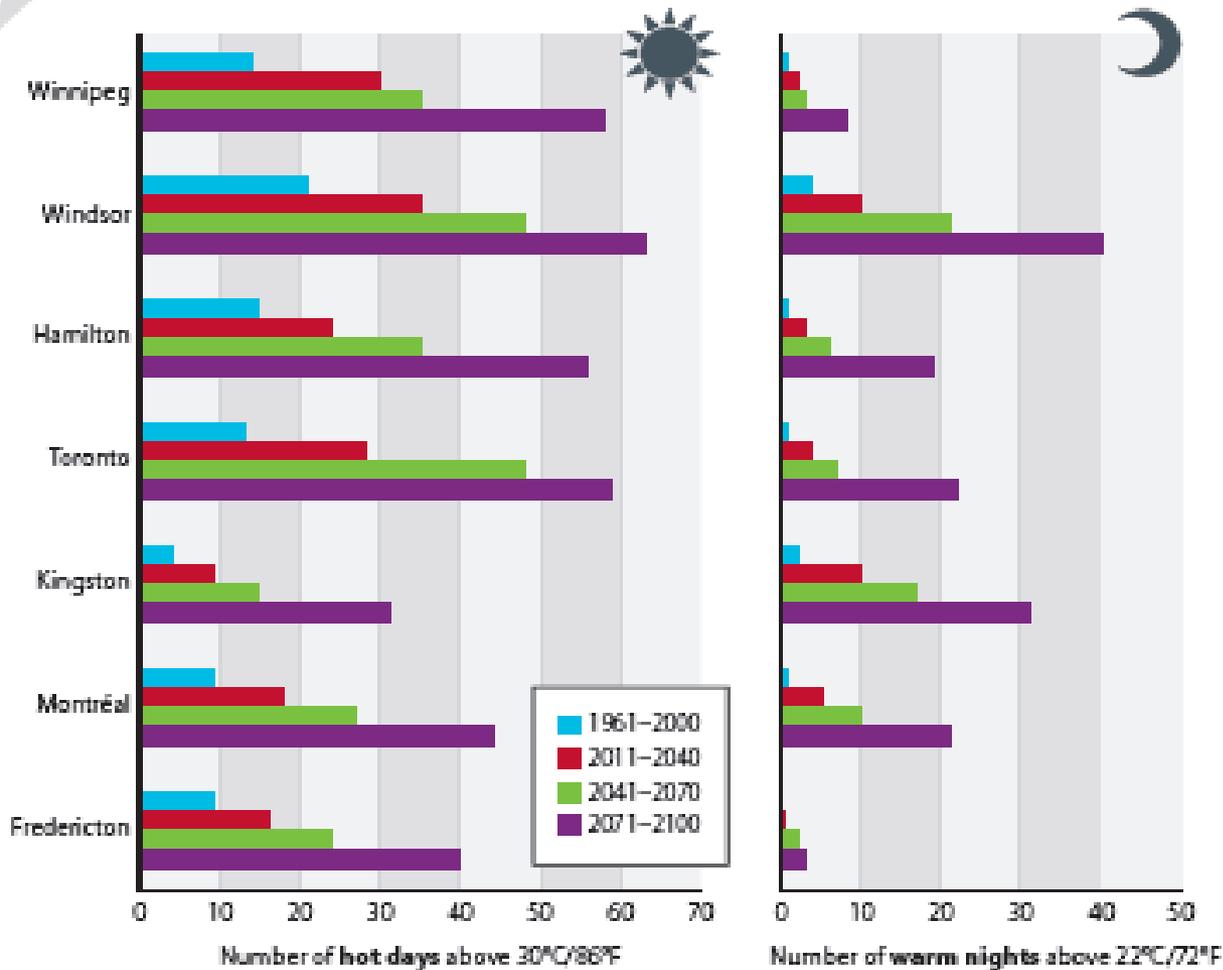


Increased Frequency and Severity of Natural Hazards

- Climate change can result in **“unprecedented” extreme events** with severe impacts on individuals and communities
- **Limited surveillance** of health impacts from extreme weather events in Canada – national level data are sparse
- Storms can affect health through the **disruption of medical care** and other social services



Extreme Heat in Canadian Communities



Drought Impacts on Health

- Droughts can lead to lower groundwater levels and stream flows, increase wind erosion of soils, and cause cracking of cisterns and cracked septic tanks – and therefore increase in **water borne pathogens** and water contamination leading to gastroenteritis
- Droughts can facilitate spread of certain **vector-borne diseases** and lead to suboptimal nutrition due to food shortages, lack of food availability, and high costs
- Droughts can also increase **stress and mental health issues**



Brazil Drought 2015

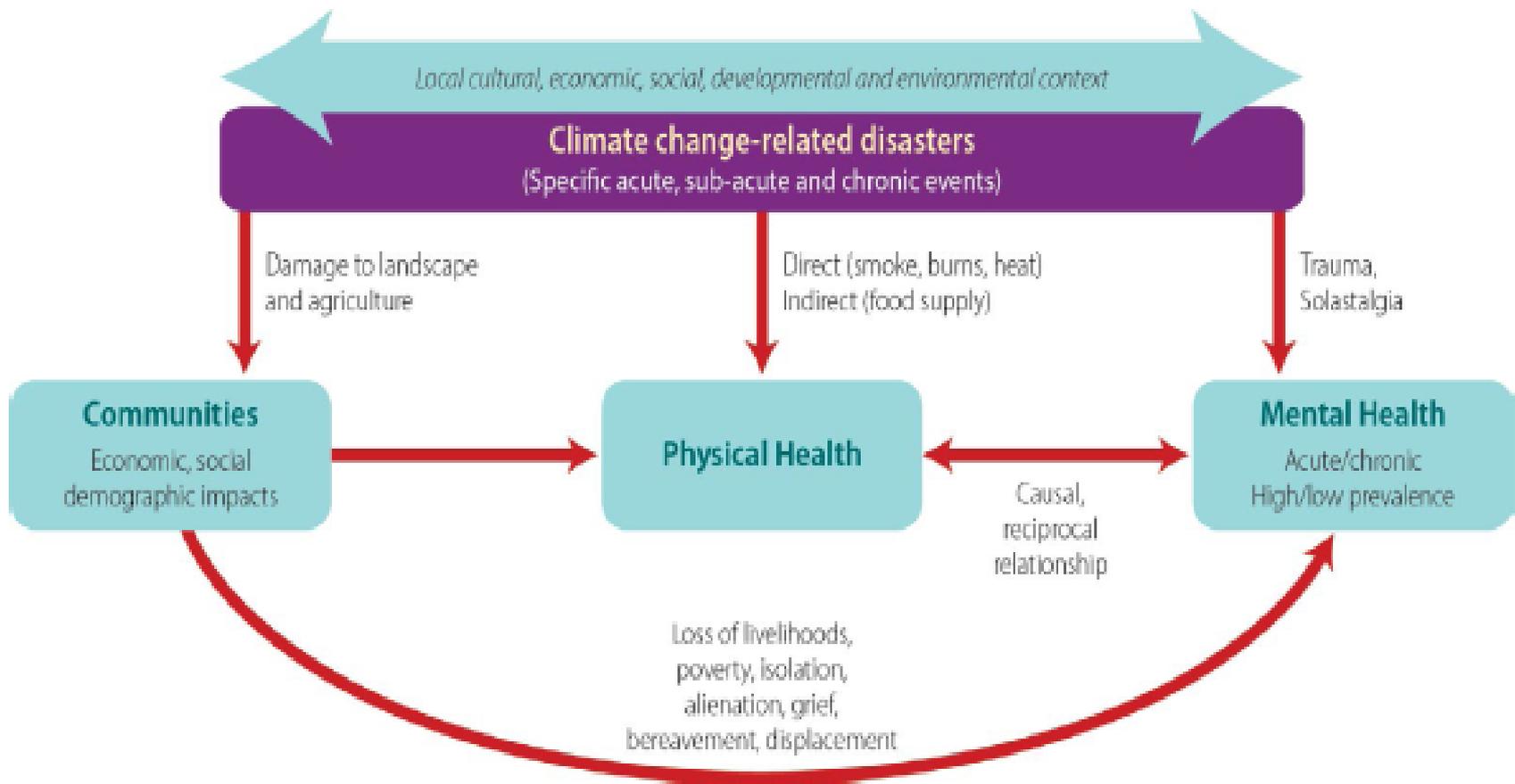
- People stockpiling water in apartments, drilling wells and other emergency measures
- Large hospitals installing in-house water treatment and recycling centers to be able to carry out surgeries and other services
- Dengue fever cases in Sao Paulo have tripled with people collecting rainwater in open buckets



<http://amazonwatch.org/news/2014/0313-from-floods-to-drought-brazils-energy-sector-faces-a-catastrophic-year>



Psychosocial Impacts of Climate Change



Key Findings

Provincial, territorial and local health authorities are gaining more knowledge of climate change and health vulnerabilities through assessments and targeted research



Urban and Rural Vulnerability to Health Impacts

Key Vulnerability Factors	Examples of Urban Characteristics	Examples of Rural Characteristics
<p>Exposure</p> <ul style="list-style-type: none"> • Geography • Land use • Climate 	<ul style="list-style-type: none"> • Complex infrastructure, high density buildings and landscape dominated by impervious surfaces • Higher population density • Higher air pollutant levels 	<ul style="list-style-type: none"> • Increased health risks from water contamination due to a high reliance on small drinking water systems • More people employed in outdoor occupations • Higher risk of exposure to land-shifts, wildfires, vector borne diseases and floods
<p>Individual Sensitivity</p> <ul style="list-style-type: none"> • Age and Gender • Health status 	<ul style="list-style-type: none"> • Ageing population • Cardiovascular and respiratory conditions in large urban centers from air pollution and extreme heat 	<ul style="list-style-type: none"> • High elderly population and high incidence of chronic illnesses, smoking and obesity
<p>Key Adaptive Capacity Factors</p> <ul style="list-style-type: none"> • Socio-economic status • Public services and risk communication programs • Employment 	<ul style="list-style-type: none"> • Greater prevalence of high risk population groups, with limited adaptive capacity (e.g. low socio-economic status) • Higher prevalence of social isolation and limited access to services (e.g. immigrants, First Nations, homeless or persons of low income or with mental illnesses) • High reliance on critical infrastructure for health care and emergency service provision that are vulnerable to extreme weather 	<ul style="list-style-type: none"> • Limited access to services during extreme events (e.g. power, water, food, medical) • Limited availability and accessibility of public services and programs and communication venues to deliver health and emergency messages • High dependency on natural resources that are vulnerable to disruption from extreme weather • Lower proportion of population highly educated • Limited livelihood and economic diversification • Limited resources and services to respond to extreme weather events and associated health burdens • Limited service access in remote communities

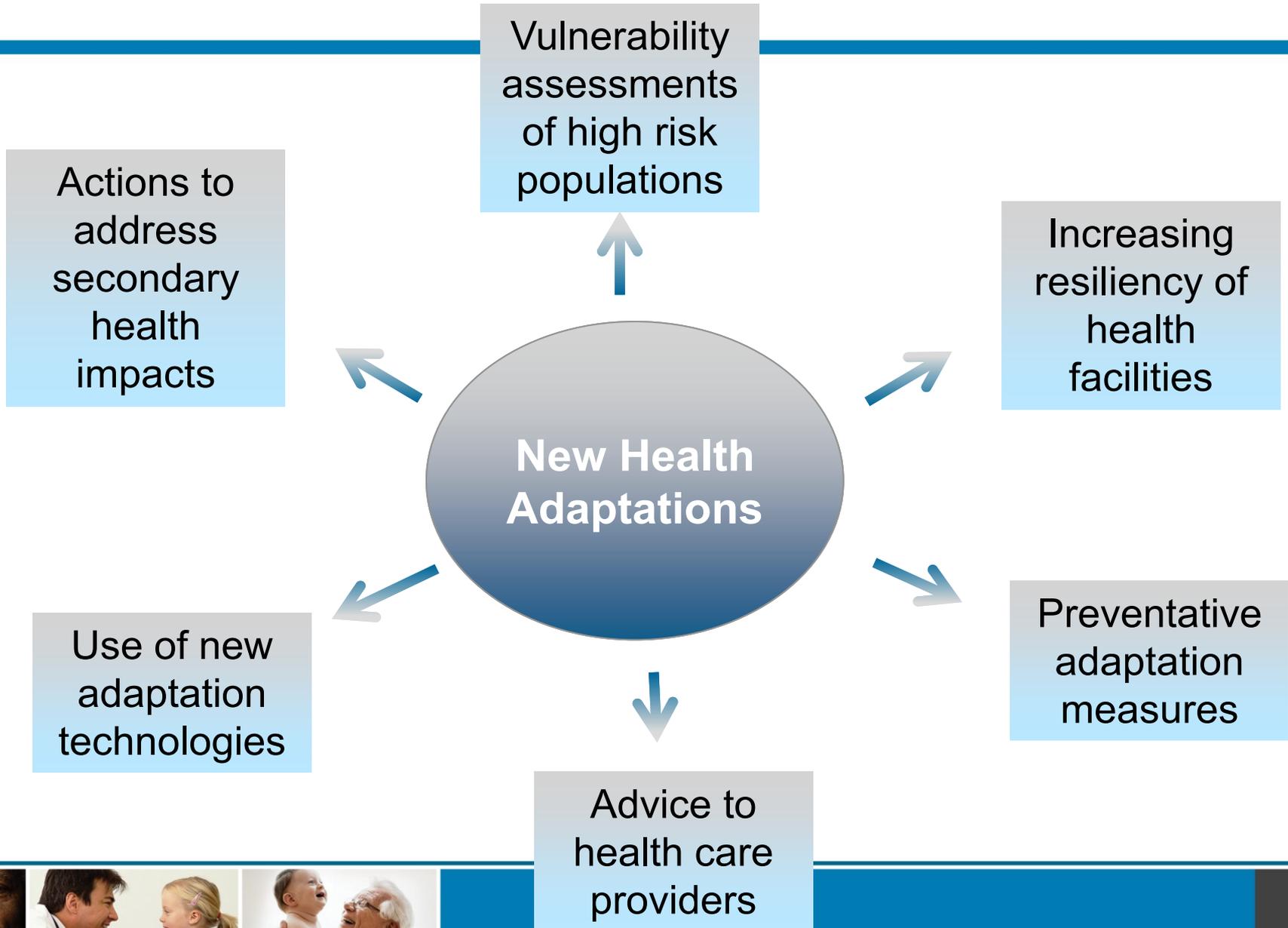
TABLE 6: Urban and rural characteristics that increase vulnerability to climate change and climate-related impacts.

Key Findings

Adaptation tools and measures, such as heat alert and response systems, projections of vector-borne disease expansion and greening urban environments can help protect Canadians from the effects of climate change being felt now and those from future impacts



Innovative Adaptations



New Tools for Adaptation

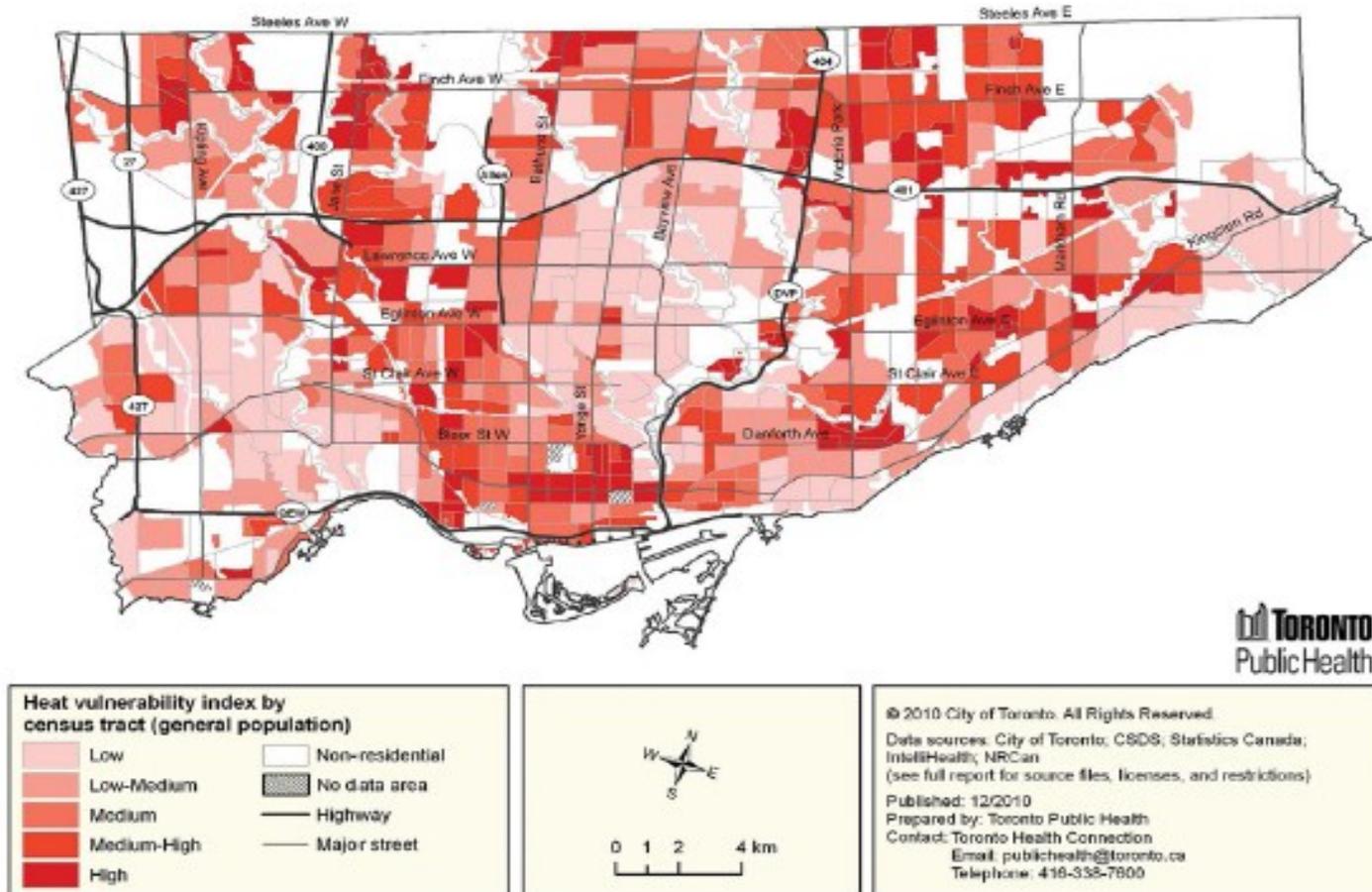


FIGURE 9: Vulnerability to heat in Toronto (Source: Toronto Public Health, 2011a).



New Adaptation Technologies

Smart Windows



<http://www.treehugger.com/clean-technology/smart-windows-may-become-reality-thanks-new-nano-coating.html>

Green Walls



<http://www.modernhippiemag.com/tag/green-walls/>

State of Health Adaptation in Canada

Adaptation can contribute to the wellbeing of current and future populations, the security of assets and the maintenance of ecosystem services now and in the future as the climate changes

- Relative to other countries Canada is making progress on health adaptation
- Canadian expertise on climate change and health issues is growing and many universities and organizations are undertaking research in this area
- Few health authorities at regional and local levels have conducted full climate change and health vulnerability assessments
- Has been increase in number of provinces and territories that have included climate change and health information and considerations in their climate change plans

